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ABSTRACT

This guide designed to be particularly useful to minority graduate students, outlines the process one must master in order to earn a doctoral degree. Through a step-by-step approach, it divides the doctoral degree process into four phases from entry to graduate school to completion of the doctoral requirements. It provides guides and checklists for monitoring one's progress through each phase of the process. Action steps and milestones are highlighted for each phase along the way. The first section, on getting off to a good start in graduate school, includes tips for dealing with department faculty and some of the basic terminology unique to graduate education, including a glossary of acronyms. A section on financing graduate education describes forms of graduate assistance, national fellowship programs, and includes a financial planning worksheet. A section on program planning explores course selection, selecting the major professor, and a doctoral process milestone checklist. The dissertation process is addressed in a section that covers the research topic area, the "doldrums' period, the dissertation itself, and microfilming and filing copies with various departments. A final section talks about making the system work for the student with tips on tapping one's full potential, and a "Ten Commandments" for completing a doctoral degree. (JB)

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Making the Grade in Graduate School:

Survival Strategy 101

by Howard G. Adams, Ph.D.

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Produced at the National Center for Graduate Education for Minorities.

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PREFACE

The ideas and suggestions contained in this GUIDE are based on over 25 years of experience in higher education and a plethora of written materials. These materials range from articles written specifically for the GEM Graduate Fellowship Program to scores of graduate school catalogs and departmental brochures that are continually reviewed as a part of the program. The definitions and suggestions provided in this GUIDE are given in the context of graduate education in general and consequently may vary from institution to institution. Students are encouraged to use this publication in conjunction with the graduate school catalog and departmental brochures from the institution in which they intend to secure their doctoral degree.

Who this GUIDE is For

This GUIDE was written to meet the informational needs of any student desiring to pursue a doctorate degree; however, it will have special salience to minority doctoral students. Its content should also prove useful to counselors, faculty advisors, mentors and administrators who are interested in improving the retention and graduation rates of minority graduate students.

The GUIDE's Approach to Success in Graduate School

This GUIDE outlines the process one must traverse and successfully master in order to earn a doctoral degree. Through a step-by-step approach, it divides the doctoral degree process into four distinct phases:

- Getting off to a good start in graduate school;
- Financing graduate education;
- Program planning; and
- Negotiating the dissertation maze.

It covers this process in chronological order, from entry to graduate school to completion of the Ph.D. requirements. In so doing, it provides several guides and checklists for monitoring one's progress through each phase of the process. Action steps and milestones are highlighted for each phase along the way.

Feel free to skip around and read what you need when you need it. If you find the GUIDE useful, please let us know. We are open to suggestions on how to make it better. We want to hear from you.

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Getting Started

Introduction

One's success in a doctoral program requires tenacity, hard work, a good mentor and the ability to overcome "glitches" that are certain to pop up.

Lots of "war" stories exist on the trials, tribulations and hardships that graduate students have encountered in pursuit of the doctorate degree. These "tales" range from stories about students who didn't make it because of their inability to get along with the departmental faculty, their failure to follow some unwritten departmental rules or their inability to get faculty to serve on their dissertation committee. Regardless of the story, the result is still the same – a student was not successful in earning the doctorate degree. Therein lies the need for this publication. While the information in this guide will be applicable to most doctoral students, it will have special salience to women and individuals of color.

If you are a beginning graduate student, these war stories may make you nervous, apprehensive and uncertain about your ability to survive a doctoral program. However, don't let them dampen your enthusiasm or spirits! True, there are lots of "glitches" that can arise in the pursuit of a Ph.D.; however, many of these can be avoided and the others can be easily overcome through a well-developed and well-executed plan of action.

This guide is designed to provide students with an overview of the process and milestones in a doctoral program. The process will be viewed in phases outlined through a four phase continuum: getting started, program planning, negotiating the dissertation maze, and making the system work for you. Figure I on the next page provides a chronology of the milestones and action steps which lead to a doctoral degree.

Getting Off to a Good Start

There is an old saying that first impressions are important. This is especially true in graduate school because the number of students in doctoral degree programs is normally small. In addition, beginning students tend to be recognized as unique individuals within the department by administrators, faculty and undergraduate students. Settling into the initial phase of a doctoral program requires that you adjust to:

- a tough, rigorous course work schedule;
- a high volume of reading materials;
- extensive library reviews and paper writing; and
- the acquisition of new research techniques and skills.

Each student must be able to demonstrate the ability to meet these demands early and thus validate competency – to the departmental faculty and other graduate students – as a valuable addition to the department.

Figure I

Milestones Leading to a Doctoral Degree*

Chronology	Action Required
Before start of each term:	Secure advising/register for classes.
First term:	Secure a major professor.
After each term:	Meet with major professor to discuss, review and revise course sequence in your tentative Ph.D. degree program.
Second or third term:	Secure commitments from individuals and hold a meeting with your doctoral dissertation/program committee.
By end of fourth term:	* Formally file a program of study.
By end of fifth term:	* Schedule and complete comprehensive/qualifying examinations. * Complete major course work.
By end of sixth term:	* Schedule and complete preliminary oral examination.
Term following preliminary oral examination:	* Submit dissertation research proposal to doctoral committee. * File dissertation title with graduate school.
Before scheduling final oral examination:	* Make arrangements to remove all program deficiencies. * Obtain approval from committee to take final oral examination. * Complete final draft of thesis.
Scheduling final oral examination:	* Verify date and time of oral examination with dissertation committee. * Schedule final oral examination with graduate school.
D-Day:	Pass the final oral examination.
Within six weeks of final oral exam:	Submit copies of final dissertation, microfilming agreement form, graduate school survey form and all graduation fees to graduate school.

* Be sure to consult with your department and graduate school to secure applicable rules and regulations governing doctoral students at your institution. In all cases, consult the graduate school catalog and the departmental graduate program guidelines.

Approach Graduate School with a Commitment to Work!

It is important that beginning graduate students understand the pursuit of a doctoral degree is graduate work! Graduate school is often referred to as graduate study. This is a misnomer. Because of the course requirements, readings, research and writing involved in a graduate degree program, a much more appropriate term is *graduate work*. Approach graduate school with a commitment to complete the doctoral program. This should be exemplified through a positive attitude and total dedication to qualitative and quantitative work.

Good work habits are a must for the rigors of a doctoral program. And good habits should begin with the preparation for your first registration as a doctoral degree student. Once an approved class schedule has been secured, a concerted effort should be made to get all the texts and required supplies for each class. It is always a good idea to read the foreword plus the preface in each text and to review the table of contents prior to the first class. This will give a basis of orientation for the class. Once classes start, demonstrate a serious commitment, a willingness to accept the challenge of scholarly work. Be sure to attend all class sessions. Engage in outside reading and problem solving exercises. And above all else, *be prepared and participate in class discussions* through asking and answering questions.

Tips for Dealing with Department Faculty

The graduate level faculty are busy professionals who spend their time teaching, conducting research, advising and mentoring graduate students, writing and consulting. Because of the nature of their work, they may initially appear distant and less open to students than what may have been your undergraduate experience. However, once you gain an understanding of the graduate school process and the protocol for dealing with graduate level colleagues, you should be able to develop a good working relationship with those faculty who teach courses or have research interest in your area of major concentration. Here are some "do's" and "don'ts" for developing a rapport with the graduate level faculty:

- Do treat them as busy professionals.
- Don't drop in on them for help or advising without first arranging a suitable time.
- Do make sure to be open to constructive criticism.
- Don't take every negative comment as a personal attack.
- Do take the initiative to build a solid foundation of support.
- Don't expect the faculty or other graduate students to seek out individuals.
- Do treat everyone with respect and honesty.
- Don't try to manipulate; this is risky and it won't work.

The Language of Graduate School

Graduate school, like other educational ventures, has its own nomenclature. Before effectively and efficiently pursuing a doctoral degree, you will need to have a basic understanding of the terminology and acronyms unique to graduate education. A typical example of the confusing terminology in higher education is the reference to a doctoral degree. In many situations, the reference is to the Doctor of Philosophy (Ph.D.) degree; however, it should be recognized that there are other doctoral degrees. The Ph.D. degree is the recognized research degree in the liberal arts, the sciences and most professional fields with the exception of education, law, medicine and theology. The Ph.D. degree has evolved from its introduction at Yale (1861) and its formalization with the founding of Johns Hopkins (1876), to a uniformed and well-defined structure (Figure II) across all graduate research universities.

Figure II

Doctor of Philosophy Degree

Doctor of Philosophy (Ph.D.) — A Ph.D. degree is one of the highest degrees awarded by universities. It is a research degree and has the following basic requirements:

1) a full-time residency requirement in an approved program of study;

2) evidence of general proficiency in a prescribed body of knowledge within a specific field as measured by a comprehensive examination; and

3) proven ability to do independent investigation on a significant problem within a specific discipline as evidenced by the presentation and defense of a dissertation on an original piece of research.

One should keep in mind that there are other doctoral degrees. In education, the Doctor of Education (Ed.D.) degree is very prominent. Individuals pursuing doctoral degrees for the purpose of teaching or public service have been awarded doctoral degrees in specific disciplines or subject matter — e.g., Doctor of Science, Doctor of Social Work, Doctor of Fine Arts, Doctor of Humanities, etc. The doctoral degree conferred in law is known as the Juris Doctor or Doctor of Jurisprudence (J.D.). In medicine, besides the Doctor of Medicine (M.D.) degree, there are professional degrees in Dental Surgery, Public Health, Veterinary Medicine, Osteopathy, Optometry and Pharmacy. And in theology, there are four and five year degree programs leading to the Doctor of Religion (D.Rel.), Doctor of Ministry (D.Min.), Doctor of Divinity and Doctor of Theology (Th.D.) degrees. The following section will help to clarify and distinguish several of the terms doctoral students may encounter.

Glossary of Terms

Admission — Normally, students are admitted to graduate school rather than directly into a Ph.D. program. Following admission to graduate school, a student must qualify for admission as a Ph.D. candidate (often referred to as "admission to candidacy") within a specific discipline.

Candidacy, Admission to — Admission to candidacy normally requires a student to successfully satisfy the following requirements:

- completion of a prescribed program of study;
- residence or residency requirement; and
- departmental qualifying examination.

Defense (i.e., Doctoral Dissertation Defense) — This is the final oral examination on a doctoral student's dissertation and the final requirement for the Ph.D. degree. The defense may take one of several forms, such as a lecture on the dissertation topic or a formal oral examination. The graduate student explains and defends for informed questioners the accuracy and significance of the research and arguments in his or her thesis.

Departmental Qualifying Examination — Most departments require doctoral students to take and pass a written qualifying examination before they are admitted to candidacy. This is a general examination that places emphasis on the student's ability to reason, formulate and solve problems and apply basic scientific and analytical skills. It is given to test the breadth

of knowledge in the major field and to gain admission to the department's Ph.D. program. Students should schedule to take and pass the departmental qualifying examination as early as possible. Normally a student would have to be registered for at least one semester of full-time graduate course work before taking the examination. Students entering with a bachelor's degree will usually take the examination early in their third year and those entering with a master's degree usually take the examination during their second year of full-time study. The departmental qualifying examination is prepared and administered by a subcommittee of the faculty drawn from each area of specialization in the student's program.

Dissertation — A written thesis that describes the problem, research and findings associated with the independent project conducted by a graduate student after completing course work and general examinations. The dissertation will vary in form and length depending on the discipline and the nature of the research project. It usually requires one to three years to complete. The dissertation is intended to show mastery of knowledge and research tools. It should contribute something new to the discipline in which it is written.

Dissertation Committee — A committee of faculty members usually chosen by the graduate student from within the student's department or closely related departments. The purpose of the committee is to help the student plan the dissertation and determine the general content of the qualifying examination or final dissertation defense. This committee usually serves as both advisors to the student and as examiners on the research performed.

Doctorate — Another word for the Ph.D. or Doctor of Philosophy degree. Those who earn the Ph.D. are entitled to use the designation "Doctor."

Doctoral Survey Form — A form completed by all doctoral students after they have passed their final oral examination. It is available from the graduate school and is used to provide data on earned doctorates to the National Science Foundation.

Major Professor — The advisor for the doctoral student chosen from among the professorial ranks of faculty members in the major area of study.

Oral Examinations — There are two types of oral examinations: the preliminary and the final.

The Preliminary Oral Examination is designed to provide the Ph.D. candidate an opportunity to present and defend the dissertation proposal. It is typically conducted by a designated committee of the department. Sometimes it is called the review panel. It may or may not be the same as the dissertation committee. The review panel is usually chaired by the major dissertation advisor (major professor).

The Final Oral Examination is given after the student's research has been completed and the dissertation has been written. The purpose of the examination is to give the student an opportunity to present and defend the dissertation. Scheduled by the student with the approval of the dissertation committee, this examination is conducted under the rules of the graduate school and is frequently referred to as the oral defense of the dissertation. The examining committee is composed of members of the dissertation committee, other members of the departmental faculty and may or may not contain faculty from outside the department. It is usually chaired by the major dissertation advisor. The candidate may not schedule to take the final oral examination until all other requirements for the degree have been satisfied. In most cases, the final oral examination must be taken within five years of passing the preliminary examination. Where the candidate fails to take the final oral examination within the five year period, the student may have to satisfy additional requirements prior to scheduling the examination.

Program of Study — The program of study should contain a unified set of courses that contribute to an organized plan of study and research. Courses are normally selected to satisfy a core curriculum and a major field requirement. Core curriculum courses provide a broad overview of a field within a specified discipline and are required for all students within a given discipline. Courses designed to satisfy the major field requirement are selected to embrace the principal subject area of a student's program. By building a solid foundation through concentrated courses in the major field, the doctoral student is expected to gain in-depth knowledge of that area and identify a dissertation topic.

Proposal — Also called a prospectus. A statement or paper in which the graduate student proposes to the departmental committee a dissertation topic and details what the dissertation will accomplish and how the research will be conducted. The proposal must be approved before formal work on the dissertation begins.

Reader — A professor responsible for advising, reading and finally approving a graduate student's dissertation. A student usually has two or three readers (the "first" reader being the major professor), all of whom have some special interest or expertise in the student's special field, and are thus in a good position to help supervise the research and writing of the dissertation.

Research Degree — A degree, like the Ph.D., which prepares the student for a career in research, scholarship and college or university teaching. The program of study requires substantial independent research and presentation of the results in a dissertation.

Residence or Residency Requirement — A specific period of time (measured in weeks, quarters, semesters or years) that a student must be enrolled as a regularly admitted, on-campus, full-time (as measured by academic credit hour load) doctoral student in a prescribed academic program of study. This requirement will vary from university to university; however, most universities require at least one academic year with an academic load of at least nine to twelve credits of graduate-level course work and/or research per term. Such a period of full-time study is intended to provide a "blocked" period of time for concentrated efforts to meet the demands of reading, study, research and writing without outside distractions.

Satisfactory Progress — A high level of academic performance is expected of all graduate students and a very high level is expected of doctoral students. Permission for an M.S. or Ph.D. student to continue in graduate school in "good standing" is contingent upon the student making satisfactory progress toward the degree as defined by the department and the graduate school. This usually means achieving and maintaining a 3.0 grade point average (G.P.A.) or better on a 4.0 scale. Grades from the following courses are used in calculating a G.P.A.:

- all courses taken for graduate credit, and
- all course work included in the doctoral plan.

In calculating the G.P.A., computations are made for all grades received, including "C" and "D" grades that normally do not count toward credits for graduate school degree requirements.

Time Limit — For the doctoral degree, there is no time limit on course work. However, for most doctoral programs the candidate must complete the dissertation and pass the final oral examination within the five year period following the date of passing the preliminary oral exam.

Glossary of Acronyms and Abbreviations

AAAS	American Association for the Advancement of Science
ABD	All But Dissertation
AAUP	American Association of University Professions
ASEE	American Society for Engineering Education
DOD	Department of Defense
DOE	Department of Energy
DoEd	Department of Education
EPA	Environmental Protection Agency
GA	Graduate Assistant
GAPSFAS	Graduate and Professional School Financial Aid Service
GEM	National Consortium for Graduate Degrees for Minorities in Engineering and Science
GRE	Graduate Record Examinations
GPA	Grade Point Average
HHS	Department of Health and Human Services
NAS	National Academy of Science
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
NRC	National Research Council
NSF	National Science Foundation
OERI	Office of Educational Research and Improvement, DoEd
PRH	Patricia Roberts Harris Fellowships
RA	Research Assistant
TA	Teaching Assistant
USDA	United States Department of Agriculture

Financing the Doctorate Degree

Graduate Education in Science and Engineering is Free!

A favorite message to prospective graduate students is "graduate education in engineering and science in America is *FREE*." The cost of attending graduate school should not prevent any student with a good academic record at the baccalaureate level from pursuing doctoral studies in engineering or science. That is, any academically prepared and motivated student, who is willing to search vigorously, should be able to locate a graduate program with resources available for support. The rationale for providing financial support to doctoral students is to allow total concentration on and full-time effort to class work and research while simultaneously eliminating the anxiety and frustration that is sometimes associated with securing financial resources to continue pursuit of the Ph.D. degree.

Forms of Graduate Assistance

The basic forms of financial support available to doctoral students in engineering and the sciences are fellowships and assistantships.

Fellowships are a form of financial assistance comparable to an undergraduate scholarship. They normally take the form of a grant or award which is not contingent upon the student performing or providing any type of services. Fellowships usually provide for payment of tuition, fees and a periodic cash stipend to defray the student's out-of-pocket living expenses (e.g., books, board, room, etc.).

Assistantships are a form of financial assistance comparable to a fellowship; however, the student is required to perform or provide some type of service in return for the financial compensation of tuition, fees and cash payment. They normally come in one of two forms:

A research assistantship (R.A.) which provides compensation to the student in return for the student's services as a research assistant to a faculty or senior staff member on an experiment or research project; or

A teaching assistantship (T.A.) which provides compensation to the student in return for the student's services as a teacher of one or more class/sections of undergraduate courses or as a teaching assistant assigned specific responsibility for grading papers or examinations.

Aid in the form of a graduate fellowship or a graduate assistantship is typically awarded based on merit. The factors normally considered in making fellowship and assistantship awards include:

- an individual's undergraduate academic record;
- graduate record examination score;
- recommendations from faculty members; and
- other germane indicators correlated with success in graduate school.

A number of fellowship programs are administered and awarded through national competitions external to university-based graduate programs. Assistantships, however, are usually administered internally through the graduate school or the department. Normally, to obtain a graduate assistantship, a student must be enrolled in a degree program and be registered as a regularly admitted, full-time student.

In the search for a graduate research assistantship, keep in mind that most funds for assistantship support are controlled by departmental faculty through their sponsored research grants and contracts. The departmental brochures and other descriptive program materials usually contain a listing of the faculty along with a summary of their research area of specialization and interest. Students interested in graduate research assistantship support should make direct contact with the individual faculty member whose research area matches the student's own area of interest.

Graduate students receiving financial support on a graduate assistantship can expect to devote 20 to 25 hours per week on assigned duties. These duties may include laboratory preparation, monitoring a student laboratory section, grading papers, conducting research experiments, advising and counseling undergraduate students, assisting with problem solving reviews, etc. Ideally these duties will complement the student's area of research – especially if the student sought assistantships with faculty who needed assistance and were working in areas of interest to the student. It should be noted, however, that this is not always the case.

National Fellowship Programs

Most national fellowship award programs are termed "portable fellowships." Such awards are made through national competitions directly to the student. The student may then choose a graduate program from among a specified number of approved institutions. There are a number of national fellowship programs that operate external to the university-based graduate financial assistance programs. Some of the major national fellowship programs and their sponsors are listed below.

American Indian Graduate Fellowship Program
Office of Indian Education
U. S. Department of Education
400 Maryland Avenue SW
Washington, DC 20202

ASEE Graduate Engineering Fellowship Program
American Society for Engineering Education
11 Dupont Circle NW, Suite 200
Washington, DC 20036

Ford Foundation Pre-doctoral Dissertation Fellowships
The Fellowship Office
National Research Council
2101 Constitution Avenue
Washington, DC 10418

GEM Engineering & Science Fellowship Programs
National Consortium for Graduate Degrees
for Minorities in Engineering & Science (GEM)
P.O. Box 537
Notre Dame, IN 46556

McKnight Black Doctoral Program
McKnight Program
201 E. Kennedy Boulevard, Suite 1510
Tampa, FL 33602

NSF Graduate Fellowship Program
National Science Foundation
1800 "G" Street NW, Room 414
Washington, DC 20550

Office of Naval Research Fellowship Program
American Society for Engineering Education
11 Dupont Circle NW, Suite 200
Washington, DC 20036

In addition to the above programs, students should also make contact with graduate fellowship programs that are sponsored by businesses, federal agencies and professional societies within the engineering and natural science disciplines. Sources of information on such programs include:

A Selected List of Fellowship Opportunities and Aid to Advanced Education. Single copy free. Available from the Publication Office, National Science Foundation, 1800 "G" Street NW, Washington, DC 20550.

Guide to Corporate Support of Graduate Education. Single copy $7.00, prepaid. Available from Council for Financial Aid to Education, 680 Fifth Avenue, New York, NY 10019.

Graduate and Professional School Opportunity for Minority Students. Single copy free. Available from the Educational Testing Services, Princeton, NJ 08540.

A Selected List of Post-Secondary Education Opportunities for Minorities and Women. U.S. Dept. of Health, Education and Welfare; Office of Bureau of Higher Education, Room 4913, ROB-3, 400 Maryland Avenue SW, Washington, DC 20202.

Graduate Financial Resources for Minority Students in Engineering and Science. Single copy free. National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM), P. O. Box 537, Notre Dame, IN 46556.

Another good source of information on graduate funding sources is the office of the graduate school. Most graduate school offices maintain a current library of announcements and applications for both internal and external fellowship programs. In addition, students are encouraged to check the campus financial aid office for internal programs germane to graduate study.

Financial Planning Worksheet

A written budget is a valuable tool for estimating the cost and tracking actual expenditures of graduate school.

Estimating financial needs as a graduate student, both expenditures and revenues, and developing a realistic plan for meeting those needs, is difficult. Yet the ability to formulate a realistic financial plan for four to six years of graduate work often means the difference between success and failure in obtaining the doctorate. The annual budget worksheet in Figure III, with samples of expenditure and revenue items, is provided to help develop a budget. The fact that an expenditure item is reflected in the budget worksheet is not to suggest that everyone should or will incur this type of expenditure. Items are included to serve as reminders that these may be legitimate obligations or

Figure III

Projected Annual Budget

Revenues:	**Your Estimate**	**School's Estimate**	**Other Student's Estimates**
Earnings	____,____.__	____,____.__	____,____.__
Savings	____,____.__	____,____.__	____,____.__
Financial Assistance			
Fellowship	____,____.__	____,____.__	____,____.__
Assistantship	____,____.__	____,____.__	____,____.__
Spouse	____,____.__	____,____.__	____,____.__
Parents/In-Laws	____,____.__	____,____.__	____,____.__
Loans	____,____.__	____,____.__	____,____.__
Other Sources	____,____.__	____,____.__	____,____.__
Total Resources	____,____.__	____,____.__	____,____.__

Expenditures:	**Your Estimate**	**School's Estimate**	**Other Students' Estimates**
Housing	____,____.__	____,____.__	____,____.__
Utilities	____,____.__	____,____.__	____,____.__
Food	____,____.__	____,____.__	____,____.__
Tuition	____,____.__	____,____.__	____,____.__
Fees	____,____.__	____,____.__	____,____.__
Books/Supplies	____,____.__	____,____.__	____,____.__
Clothing	____,____.__	____,____.__	____,____.__
Transportation			
Car Note	____,____.__	____,____.__	____,____.__
Gasoline	____,____.__	____,____.__	____,____.__
Insurance	____,____.__	____,____.__	____,____.__
Repairs	____,____.__	____,____.__	____,____.__
Insurance			
Dental	____,____.__	____,____.__	____,____.__
Life	____,____.__	____,____.__	____,____.__
Medical	____,____.__	____,____.__	____,____.__
Recreation/Social	____,____.__	____,____.__	____,____.__
Child Care	____,____.__	____,____.__	____,____.__
Savings*	____,____.__	____,____.__	____,____.__
Emergencies*	____,____.__	____,____.__	____,____.__
Total Expenses	____,____.__	____,____.__	____,____.__
Revenues minus Expenses	____,____.__	____,____.__	____,____.__

* A minimum of 5% of cash revenues for savings and emergencies.

revenue sources that students should consider. Typical of such expenditure items are credit card charges or open accounts at local retail establishments. Medical and dental expenses may not be covered through the campus plans and may therefore have to be covered through a personal insurance program. Remember to allow for unexpected expenses. Also, look for untapped resources such as renting, leasing or providing services that have a monetary value to classmates, friends and acquaintances. For instance, tutoring undergraduates is an excellent way to earn money while reviewing fundamentals and developing teaching skills. Other examples are housesitting, providing transportation and renting personal items such as golf clubs and skies. Knowledge of the local area or a particular skill (typing, music, etc.) are examples of services that could be sold on a part-time basis.

Program Planning

In addition to dedicating oneself to hard work and securing funding, an individual pursuing a Ph.D. degree must also have clearly defined goals and a program plan for achieving those goals. The goals need to be focused and specified in such a way that the end result is achievement of a desired outcome — in this case, the Ph.D. degree. Part of the plan will be the accomplishment of the "milestones leading to a doctorate" as delineated in Figure I; part of the plan will be the development of a financial plan that addresses the concerns delineated in an annual budget (see Figure III); and part of the plan will involve developing a program of study that facilitates achievement of the desired outcome.

Figure IV

Program of Study

The program of study consists of a unified set of courses that contribute to an organized plan of study and research. Courses are normally selected to satisfy a *core curriculum* and a *major field of study* which are defined as follows:

Core curriculum — courses that all students in a given discipline must take; required courses which provide a broad overview of a field within a specified discipline.

Major field — a sequence of courses designed to expose the student to a concentrated study of issues germane to the phenomenon which is the object of the student's research and dissertation topic.

Planning in the context of a doctoral program refers to the development of an outline of requirements, action steps and a time frame to accomplish the goal of obtaining a Ph.D. degree.

Course Selection

Ph.D. programs typically do not have a prescribed course requirement. Instead, each doctoral student, with the advice and counsel of the major professor, is expected to develop a program of study that is consistent with the student's background and which is likely to result in the accomplishment of projected graduate study goals. In some cases there are certain "core courses" that all students in a particular major area of concentration are expected to have completed at one time or another. Beyond these core courses, students are advised to choose courses and a research area consistent with personal academic and career goals.

Prior to outlining a program plan and selection of courses, the student should obtain the graduate school catalog, the departmental graduate program brochure and the university-wide schedule of graduate courses. Each of these should be thoroughly read to gain an understanding of what is required, the sequence of courses and prerequisites, and the rules and regulations governing how a doctoral student is to proceed through the program.

Selecting the Major Professor

As early as possible, and preferably by the end of the second term of full-time study, each doctoral student should identify and gain the commitment of a faculty member to serve as the major professor. The major professor is the departmental faculty member who serves as the doctoral student's advisor. This professor advises the student about course requirements and possible electives, supervises the student's research and chairs the dissertation committee and the final oral examination committee. When possible, major professors should be recognized experts in their fields and have the academic rank of a full or associate professor.

Selection of the major professor is one of the critical early decisions a doctoral student makes. In addition to serving as the major advisor, this person will become that all-important confidant, mentor, sponsor and advocate for the student throughout the doctoral process. Because of the one-on-one relationship that needs to be developed between the student and the major professor, careful scrutiny must be used in making this choice.

To facilitate the selection of a major advisor, the doctoral student should make "get acquainted" appointments with each faculty member in the department. During these visits, questions should be asked to ascertain the faculty member's research area, availability, time and commitment to serve as a major advisor, expertise in a particular graduate study area, and resources to support a student through doctoral research. It can be extremely beneficial to identify an individual who is working on a major research project and needs someone to assist in researching a unique aspect of the study.

As noted in the treatise, *Mentoring: An Essential Factor in the Doctoral Process for Minority Students*,* selecting a major professor is crucial. A Ph.D. student needs a strong major professor who will take the role seriously and is willing to serve as a mentor. In addition, the major professor should:

- invest time and resources in the development of the student;
- legitimize the student's choice of a research career;
- communicate in an open and honest manner;
- provide constructive, objective and sound critiques;
- hold the student to high standards of academic excellence;
- be an advocate for the student; and
- facilitate the student's professional development.

Doctoral Process Milestone Checklist

milestone = a stone that functions as a milepost; a significant event in the development, life or process of an individual.

Just as a traveler needs a milepost to chart and verify direction for a trip, a graduate student in a doctoral program needs a plan outlining goals and action steps. Carefully delineated and charted milestones can mean the difference between success and failure for a graduate student. The milestone checklist in Figure V provides such a framework. It gives points of reference on which to hang dates for important steps in the doctoral process. Using it will allow students to chart their progress while keeping details of the process clearly focused.

Used in conjunction with the "milestone's leading to a doctoral degree" (see Figure I), students can reconcile individual progress with the suggested time frame presented earlier. It is recommended that prospective graduate students compare the chronology of action events in Figure I with the

* Single copies of this guide are available from the GEM Center, P.O. Box 537, Notre Dame, IN 46556.

Figure V

The Ph.D. Milestone Checklist

Milestones	Projected Completion Date	Actual Completion Date	Comments
Enroll in Graduate School	___/___/___	___/___/___	
Selection of Major Professor	___/___/___	___/___/___	
Program of Study Formalized	___/___/___	___/___/___	
Comprehensive Exam Passed	___/___/___	___/___/___	
Approved for Candidacy	___/___/___	___/___/___	
Course Work Completed	___/___/___	___/___/___	
Preliminary Oral Exams	___/___/___	___/___/___	
Dissertation Topic Approved	___/___/___	___/___/___	
Dissertation Completed	___/___/___	___/___/___	
Final Oral Exam Passed (D-Day)	___/___/___	___/___/___	
Microfilm Form	___/___/___	___/___/___	
Survey of Earned Doctorates Form	___/___/___	___/___/___	
Payment of Fees for Dissertation	___/___/___	___/___/___	
Processing/Microfilming	___/___/___	___/___/___	
Dissertation Submitted	___/___/___	___/___/___	

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time frame for the completion of Ph.D. activities by departmental majors. The latter is normally published in the institution's graduate school catalog and selected departmental publications. This reconciliation will help an individual to complete Column 2 (Projected Completion Date) of Figure V, "The Ph.D. Milestone Checklist." Events in Figure V that have not been accomplished by the projected completion date should serve as indicators to make an immediate assessment of progress. Failure to meet a projected date should not be interpreted as cause for radical action! They should serve as formative evaluation points with respect to successful completion of the overall project and achievement of the goal — a program of study and a Ph.D. degree, respectively.

Negotiating the Dissertation Maze

Unlike the baccalaureate and master's degrees, the Ph.D. degree cannot be earned by an accumulation of course credits alone. After demonstrating fundamental competence in the subject area through successfully passing the preliminary examination, each doctoral student must develop, implement and complete an approved research project that culminates in a written dissertation.

The Research Topic Area

To get the dissertation phase started, each student must identify a research topic — a significant problem deemed worthy of investigation — and secure approval from the major advisor and the dissertation committee to begin doing research. Multiple sources are used to identify a suitable research topic area. These include:

- the major advisor and dissertation committee;
- departmental research review groups and seminar series;
- current scientific publications and journals, especially in the student's major area of specialization; and
- summer internships and co-op assignments with major business and industrial organizations engaged in research and the utilization of technology in the student's area of specialization.

In some cases the doctoral student will have complete freedom to select a research area. In other situations, especially where the student may be part of a research team funded through a research grant, the research area may be defined by the major professor.

Regardless of the source of assistance for determining a topic area, it is wise to keep the final problem and research scheme simple. A broad, expansive topic and design can seem appealing, but keep in mind, this is just the beginning of your research career. You do not have to solve all of the "world's problems" with your doctoral research and dissertation.

Following identification of the research area, a dissertation proposal (prospectus) is written and submitted to the student's major advisor. The proposal is an informal document in which the student justifies the significance of the proposed problem and outlines personal capabilities to conduct the research. It should contain:

- a review of the literature based on studies germane to the proposed research problem;
- references to individuals who have done similar research and made significant contributions to understanding the proposed phenomenon scheduled for investigation;
- a conceptual framework for the research scheme, investigative methodology, instrumentation and statistical analysis; and
- the likelihood of obtaining significant results.

The proposal is then presented to the dissertation committee as a part of the preliminary oral examination. Successful students are granted approval to begin the formal part of their doctoral research.

The "Doldrums" Period*

During the pursuit of the doctorate, some graduate students encounter the "doldrums" — a listless, inactive period in which very little or no work toward the degree is accomplished. The "doldrums" tend to occur after the course work is completed and while the student is engaged in research activity or is writing the dissertation. Indicators of the "doldrums" are: prolonged periods of inaction, low productivity, and frequent revision of milestones. When doctoral students find themselves procrastinating and kidding themselves about their progress due to the "doldrums," they must fight through this period to get back on track. Dr. Johnetta Davis notes that the best way to do this is to "reestablish priorities and then begin to set daily reachable goals — Today I will do this!"

Dr. Davis suggests two root causes for the "doldrums": not having a clear idea of the research area before admission to candidacy, and becoming comfortable as a "professional" graduate student and thus not pushing oneself to finish. In her description of the doctoral process, Dr. Davis identified three different learning experiences that graduate students encounter: controlled, feedback and independent (see Figure VI). She notes, "it's one thing to go to class, that's a controlled requirement, but to research a unique problem and then write a dissertation is an independent activity — an activity requiring much more self-motivation and discipline."

Figure VI

Doctoral Student Learning Experiences

Controlled — guided by a professor; structured learning (in class).

Feedback — an analysis and discussion of facts to indicate a grasp of certain information; processed learning (through examination).

Independent — identifying a problem, researching a solution and reporting the findings; independent learning (from research and writing the dissertation).

The Dissertation

Following completion of the research, a doctoral thesis (dissertation) is written to: present the work done, show results and draw conclusions, establish a relationship with previously completed work, and to suggest implications for future work in the field.

The dissertation writing stage of the doctoral process is a critical time. Given the independent nature of the work during this period, many students become distracted and, consequently, lose time. They allow other competing forces (the job search, family demands and expectations, assistantship responsibilities, personal and social demands, etc.) to influence their priorities, especially with respect to completion of the doctoral degree requirements. The result for some students is that the time between admission to candidacy and completion of the degree requirements gets stretched out an extra six months to a year — and in some cases even more! Sometimes the students totally lose focus and permit competing forces to divert their attention from the task of completing the doctoral degree requirements. This latter group becomes a part of the ever-growing frustrated students who are termed ABD — all but dissertation. To stay on schedule and not become another ABD statistic,

* Adapted from a conversation with Dr. Johnetta Davis, Associate Dean, Graduate School of Arts and Sciences, Howard University, Washington, DC.

students must pay attention to the final milestone, completion of the doctoral program and receipt of the Ph.D. degree.

The nature of the doctoral program emphasizes independent learning. The thesis research and the written dissertation must be the candidate's own work. In carrying out the investigation, the student is expected to collaborate with fellow students, faculty and others doing similar research, but in all cases, the final dissertation is the candidate's contribution to the scientific community. After the dissertation is written and tentatively approved by the major advisor, a final oral examination (defense) is held to determine if the work is acceptable. Following the final oral defense and approval of the dissertation, the candidate prepares the document for publication.

Microfilming

Most graduate schools have an agreement with University Microfilms International in Ann Arbor, Michigan, for microfilming of the doctoral dissertation and for publication of the abstract of the dissertation in Dissertation Abstracts. The forms for handling this are available in the graduate school office.

After successful completion of the final oral examination, each student is required to submit a specified number of corrected, final copies of the dissertation to the graduate school; file the dissertation abstract form; complete the doctoral survey form; and pay the required fees for the cost of microfilming the dissertation and publication of the abstract.

Making the System Work for You

Essentials for Tapping One's Full Potential

Don't be apprehensive, nervous or uncertain about your ability to complete a doctoral program. Most problems can be overcome with hard work, motivation, planning and follow through. Success in graduate school is possible! There are a lot of people with Ph.D. behind their names!

Figure VII contains a series of "Essentials for Tapping One's Full Potential as a Graduate Student." Internalizing these "essentials" — making them a part of your operating attitude — allows one to develop the resolve necessary to sustain you through a doctoral program. Students who function from such a mode exhibit a posture of maturity and seriousness that serves them well.

Of all the essentials, none are more important than staying focused and maintaining a personal drive to succeed. You must push yourself at all times and remain cognizant of the time frame for completing your degree program. Time frames should consist of two components: "time to candidacy" and "time to degree." Each student should function from a position of:

- I will complete the requirements for candidacy by ___(date)___; and
- I will complete the requirements for the doctorate by ___(date)___.

Spending more time on class assignments, in the laboratory on research and in the library reading will result in a more effective and productive student. Your success is largely in your hands.

Once the decision is made to pursue the doctorate, take advantage of all available resources, facilities and people. As you progress through the doctoral process, it is incumbent upon you to watch for early warning signs that some phase of your work is not progressing satisfactorily or is not on schedule. Closely monitor your program plan, paying particular attention to the established milestones.

Be alert to all program changes suggested by your advisor, dissertation committee, the departmental faculty and/or the graduate school. Question any major changes that might significantly alter your program or greatly extend the time to degree. Remember, you are in charge of your own destiny as a doctoral student. No matter how many other people or forces might try to dictate your plan of action, getting the required work done is your personal responsibility.

One final note, be flexible! Though you may want to follow your plan of action as rigidly as possible, it is no disgrace for a four year plan to become a five year plan. Getting the degree is paramount.

Ten Commandments for Completing the Ph.D.

I *Thou shall venture into a doctoral program only if thou art motivated and committed to hard work.*

Hard work makes success possible. Before embarking on a doctoral program, ask yourself: "Do I enjoy rigorous academic challenges?" "Am I willing to devote full-time effort to this endeavor?" "Am I committed to forgoing other plans for the duration of a doctoral program?" Nothing will be as important as devotion to task and willingness to work hard.

Figure VII

Essentials for Tapping One's Full Potential as a Doctoral Student

- Abandon the nine-to-five mentality.
- Accept failure as an opportunity to learn.
- Act like you belong; function with a purpose.
- Believe in yourself.
- Carefully balance time and resources.
- Chart and focus on milestones.
- Don't take everything that happens around you personally.
- Don't isolate yourself.
- Establish realistic and concrete goals and objectives.
- Anticipate and plan for the unexpected.
- Give yourself a "cookie" for accomplishments, however small.
- Keep stress levels down by developing stress coping skills.
- Maintain a positive attitude.
- Read, read, read everything all the time.
- Roll with the "punches"; some things are inevitable.
- Seek advice, listen and learn from others.
- Seek and utilize assistance as needed.
- Stay away from activities that distract.
- Understand and follow the rules and regulations.
- Work through down periods.

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II *Thou shall look to thyself first; success begins there.*

People who spend too much time looking to others for result, don't get the most out of their own abilities. The ability to achieve your personal best shouldn't be hampered by negative behavioral patterns. Be positive! Spend time wisely. Take pride in your work and demonstrate the ability to become a scholar.

Completing the doctorate depends on drawing upon the talents and advice of others as well as utilizing available resources. Take the initiative — seek advice and ask questions.

Individual tenacity to survive and the ability to persevere are the two main factors that determine success in graduate school.

III *Thou shall lay out a written program plan early.*

If the old adage "those who fail to plan, plan to fail" is true, then the starting point on the road to the Ph.D. is the program plan, a frame of reference for determining:

- what is to be done;
- how it is to be done;
- when it is to be done; and
- how to monitor what is done.

Before attempting to outline a program plan, you will need to know what is expected of doctoral students and what the requirements are for your particular program. Consult the graduate school catalog, the departmental graduate program brochure, your major advisor, and the departmental graduate coordinator. In developing the plan, don't put too much emphasis on the end results; rather concentrate on establishing measurable, timely steps in the process.

IV *Thou shall stay focused on program milestones.*

Once a written action plan is established, it is important that specific strategies for achieving each milestone be articulated. Milestones are important because they establish a time frame for completing the doctorate and help one to stay focused. They also establish parameters for accountability.

Valuable time is sometimes wasted during graduate school due to a lack of self motivation and the failure to stay focused. This is particularly true during the research and dissertation writing stage. Is there a secret for staying focused? Yes, and it is simple. Fight through the low periods by keeping two points of reference clearly in mind; time to candidacy and time to completion of the dissertation. These are the major milestones; thus, they must become the driving force for staying motivated and focused.

V *Thou shall accept and learn from constructive criticism.*

Feedback and critical review are distinguishing characteristics of the doctoral process. It is unrealistic to expect each advising session and all program reviews to be positive. Some doctoral students allow critical analysis of their work to become a negative wedge between themselves and the advice giver. As a result, rather than learn and grow from such advice, they negate it. At best, such an attitude compromises the efforts of all concerned. At worst, it may cause a strain in relationships. By all means, respect and honor the critical reviews and advice of the major advisor, dissertation committee and the faculty.

VI *Thou shall abide by the rules of the academy and, by all means, stay out of campus politics.*

Graduate students are expected to adhere to an established code of professional conduct, written or implied, and must assume full responsibility for the content and integrity of their work.

Don't become isolated from departmental activities, the research group or the academic people who control and shape your program.

Never, never "play" one faculty member against another. In time, the faculty member treated with careless disregard may be the one who decides your fate as you move through your program. Try to avoid making negative statements or unkind remarks. Such behavior can cause you to be labeled a "non-team player."

VII *Thou shall think small when choosing a dissertation topic area.*

A major program requirement for obtaining a Ph.D. is the design and completion of the dissertation. In selecting the topic area, design and implementation scheme, keep everything simple. Don't look to becoming famous by making a major scientific discovery. Remember, all the "world's problems" don't have to be solved with your research and dissertation. All that is required and expected is an original piece of work that will add new findings to ongoing scientific investigation.

VIII *Thou shall be aware of personal limitations and be willing to admit that thy might not knoweth everything.*

The purpose of a doctoral program is to:

- expand and add depth to one's academic prowess in a chosen subject area;
- broaden one's knowledge base through extensive searches and reviews of the literature; and
- sharpen and refine one's analytical thinking and writing skills.

Learning to realistically assess the attributes and skills that one brings to graduate school is critical to successfully negotiating a Ph.D. program. More importantly, knowing your limitations helps to establish a reference point for what is already known and what needs to be learned. After all, you are in graduate school to learn.

IX *Thou shall consult with thy advisor, a valuable asset.*

Use your advisor and other faculty members to explore graduate study goals and strategies. The major advisor should be viewed as a "store house" of information on career options, courses, operating procedures, programs, professors and resources. More importantly, the advisor is there to serve as a "sounding board" for working through the selection of courses, planning and laying out a program plan, preparing for the various required examinations and establishing a time frame for completing the doctorate. Frequent discussions and advising sessions should be held with the major advisor. Through such sessions you should be able to obtain course syllabi, previous examination questions, leads on research areas, literature reviews, student evaluations of courses, etc.

X *Thou shall not leave the university until the dissertation is completed.*

The urge to get on with life has caused far too many doctoral students to leave school as ABDs (all but dissertation). Don't! Have patience, patience, patience! Surveys show that one out of two people who leave school and accept full-time employment prior to completing their dissertations never receive the doctorate. It is, therefore, in the student's best interest to remain in school full time and forgo accepting employment until all work on the dissertation is completed.

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Worksheets

Program Plan

Student's name: _____

Degree objective: _____

Major area of concentration: _____

Minor area of concentration: _____

Total units for degree: _____ Major units: _____ Minor units: _____

Using the graduate school catalog and the departmental graduate brochure, identify: 1) graduate school requirements for all students, regardless of major; 2) departmental requirements for individuals in your graduate degree program; and 3) prerequisites associated with the graduate school and departmental requirements which must be satisfied. Use the sections below to list all courses that you must take from the core curriculum, your major field and related electives.

Core Curriculum:

Course Number & Title	Units	Prerequisites

Major Field:

Course Number & Title	Units	Prerequisites

Electives:

Course Number & Title	Units	Prerequisites

Program Plan Checklist

1st Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

2nd Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

Comprehensive Exam: Date _____

3rd Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

4th Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

5th Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

Preliminary Exam: Date _____

6th Term: Fall _____ Winter _____ Spring _____ Summer _____ Year _____

Course Number	Units	Grade	Comments

Final Oral Exams (Dissertation Defense): Date _____

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About the Author

Howard G. Adams, Ph.D., is executive director of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM), headquartered at the University of Notre Dame, Notre Dame, Indiana. From 1989 to 1991, Adams served as a member of the U.S. Congressional Task Force on Women, Minorities and the Handicapped in Science and Technology. He has traveled throughout the United States to give seminars and lectures to educational, corporate and civic groups on minority participation in graduate education. He has written numerous magazine and journal articles and is author of *Successfully Negotiating the Graduate School Process: A Guide for Minority Students* and *Mentoring: An Essential Factor in the Doctoral Process for Minority Graduate Students*. Before joining GEM, Adams was vice president of Student Affairs and director of Alumni Affairs at Norfolk State University, Norfolk, Virginia.

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Mentoring: An Essential Factor in the Doctoral Process for Minority Students

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Minority Student Graduate School Information Kit

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1990 GEM Teleconference: "Why Graduate School in Science and Engineering"

1991 GEM Teleconference: "What is Graduate School and How Do You Select One"

1991 GEM Teleconference: "Partners in Progress – the GEM Story"

1992 GEM Teleconference: "Graduate School: Paying the Bill"

This is GEM

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Chartered in 1976, GEM is jointly sponsored by 70 university and 85 employer members. It is governed by a Board of Directors comprised of one GEM representative for each university and each employer member. The Board is responsible for policy and serves as the legal representative of the Consortium.

On September 1, 1989, the National Consortium initiated operation of the GEM Center for Graduate Education for Minorities. Through the Center, comprehensive nationwide programs have been established to identify, recruit and enroll minority science and engineering students in graduate programs leading to an advanced degree. The Center serves as the hub and focus for six GEM program components:

1) GEM M.S. Engineering Fellowship Program;
2) GEM Ph.D. Engineering Fellowship Program;
3) GEM Ph.D. Physical/Life Science Fellowship Program;
4) Database Clearinghouse/Research Component;
5) The JOURNEY Project – a guidance counseling series of videotapes to motivate students toward careers in science and engineering; and
6) "Why Graduate School?" – an annual nationwide teleconference designed to provide students with information on making the decision to pursue graduate studies and on selecting, gaining admission, financing and completing a graduate program.

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